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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/821,546	03/30/2001	Jin-Yuan Lee	MEG2000-012	4705

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EXAMINER	
OWENS, DOUGLAS W	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 09/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/821,546	LEE ET AL.	
	Examiner	Art Unit	
	Douglas W Owens	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-13,15,17,19-32 and 34-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *26-32 and 34-41* is/are allowed.

6)☒ Claim(s) *11-13,15,17,19-25 and 42-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 5, 2004 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 11 – 13, 15, 19, 20 and 22 – 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Application Publication No. 2001/0021541 to Akram et al. in view of US Patent Application Publication Numbers 2002/0163055 and 2002/0170746 to Thomas and Master et al. respectively and US patent No. 6,355,507 to Fanworth.

Regarding claim 11, Akram et al. discloses a method of forming a chip scale package, comprising the steps of:

providing one or more chips (Fig. 1, (12)) having I/O pads (Fig. 6 (16)) with UBM layer (Fig. 6 (23)) on the surface of the I/O pads;

providing a substrate (Fig. 1A(118)) with a thickness of up to 250 microns (section [0053]), which is within the claimed range;

applying an adhesive layer over said substrate (paragraph [0052]), forming an ad-substrate composite;

forming openings (21) in the ad-substrate composite to match the spacing of corresponding the I/O pads (16) of the chip;

attaching the chips on the ad-substrate composite wherein the I/O pads of the chips are placed on the corresponding openings on the ad-substrate composite to form a package (10);

performing ball mounting over the openings on said ad-substrate of the package (22, 24); and

forming the CSP.

Akram et al. does not teach an adhesive layer with a thickness between 10 to 100 microns. Akram et al. is silent with respect to the thickness of the adhesive layer, only mentioning that an adhesive is applied. It would have been obvious to one of ordinary skill in the art to arrive at the optimal thickness of the adhesive layer through routine experimentation, since it is desirable to provide adhesive layers having sufficient adhesiveness. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Moreover, one having ordinary skill in the art would have been required to arrive at the optimal

thickness of the adhesive though experimentation, since Akram does not disclose the preferred thickness.

Akram et al. does not teach sawing the substrate to form the CSP. Sawing is a known method of singulation, as taught by Thomas (paragraph [0036]) and it would have been obvious to one of ordinary skill in the art to use a known and frequently practiced method of singulation, since it is desirable to use proven methods.

Akram et al. further teaches using a polymeric substrate (sections [0016] and [0051] - [0053]). Akram et al. does not teach using bismaleimide triazine, a known polymer, for the substrate, as evidenced in paragraph [0035] of Master et al. It would have been obvious to one of ordinary skill in the art to employ the use of a known polymer, since it is desirable to use reliable materials that are suitable for the intended use.

Akram et al. does not teach forming a molding material around the package. Fanworth teaches forming a molding material around the package (Fig. 4 (32); Col. 6, lines 30 – 35). It would have been obvious for one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Fanworth into the method taught by Akram et al., since it is desirable to protect the chip from contamination and damage.

Regarding claim 12, Akram et al. teaches a method, wherein the chip comprises silicon (Paragraph [0005]).

Regarding claim 13, Akram et al. teaches a method, wherein the I/O pads are an area array type (paragraph [0048]).

Regarding claim 15, Akram et al. teaches a method, wherein the substrate comprises a ball grid array.

Regarding claim 19, Akram et al. teaches a method, wherein forming the openings is accomplished by mechanical or laser drilling, or screen printing (paragraph [0084]).

Regarding claim 20, neither Akram et al., nor Fanworth, Thomas or Masters et al. teach a method, wherein the openings have a diameter between 350 to 900 microns. It would have been obvious to one of ordinary skill to arrive at the optimal diameter through routine experimentation, since it is desirable for the diameter to be a sufficient size for the contacts.

Regarding claim 22, Akram et al. does not teach a method, wherein the molding comprises epoxy resin. Fanworth teaches a method, wherein the molding comprises epoxy resin. It would have been obvious to one of ordinary skill to incorporate the teaching of Fanworth into the method taught by Akram et al. for reasons discussed above.

Regarding claim 23, Akram et al. and Fanworth do not teach a device wherein the molding material has a thickness between 100 to 500 microns. It would have been obvious to one of ordinary skill to arrive at the optimal thickness of the molding through routine experimentation, since it is desirable for the molding to be structurally sound.

Regarding claim 24, Akram et al. does not teach a method, wherein the ball mounting is accomplished with a solder comprising tin-lead or tin-silver alloy. Fanworth teaches a method, wherein the ball mounting is accomplished with a solder comprising

a tin-lead alloy (Col. 5, lines 29 – 34). It would have been obvious to incorporate the teaching of Fanworth into the method taught by Akram et al. for reasons discussed above. Additionally, the tin-lead alloy and tin-silver alloy are known materials that are well suited for the intended use.

Regarding claim 25, neither Akram et al. nor Fanworth teach a method, wherein the height of the ball mountings is between 300 and 800 microns. It would have been obvious to arrive at the optimal height through routine experimentation, since it is desirable for the ball mounting to have a size that would ensure a reliable contact.

4. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akram, Fanworth, Thomas and Masters et al. as applied to claim 11 above, and further in view of US Patent No. 5,882,956 to Umehara et al.

Neither Akram et al., nor Fanworth, Thomas or Masters et al. teach a method, wherein the adhesive layer comprises polyimide thermocompression adhesive. Umehara et al. teach using a polyimide thermocompression adhesive (Col. 2, lines 50 – 55). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a polyimide thermocompression adhesive, since it is a known material and it is desirable to use materials that are well suited for the intended use, as well as employing reliable adhesives.

5. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akram et al., Fanworth, Thomas and Masters et al. as applied to claims 11 – 15, 17, 19 – 20 and 22 – 25 above, and further in view of US patent No. 6,265,782 to Yamamoto et al.

Neither Akram et al., nor Fanworth, Thomas or Masters et al. teach a method, wherein the attaching is accomplished by subjecting the adsubstrate to a temperature between 250° to 350° C at a pressure between 1.5 to 2.5 Mega Pascals. Yamamoto et al. teaches a method, wherein the attaching is accomplished by subjecting the adsubstrate to a temperature between 250° to 350° C at a pressure between 1.5 to 2.5 Mega Pascals (Col. 9, lines 31 – 33 and 42 – 44). It would have been obvious to incorporate the method taught by Yamamoto et al. into the proposed method taught by Akram et al., Fanworth, Thomas and Masters et al., since it is desirable to form a satisfactory bond.

6. Claims 42 – 45 and 47 – 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akram et al. in view of Fanworth, Thomas, Master et al. and Yamamoto et al.

Regarding claim 42, Akram et al. discloses a method of forming a chip scale package, comprising the steps of:

providing one or more chips (Fig. 1, (12)) having I/O pads (Fig. 6 (16)) with UBM layer (Fig. 6 (23)) on the surface of the I/O pads;

providing a substrate (Fig. 1A(118)) with a thickness of up to 250 microns (section [0053]), which is within the claimed range;

applying an adhesive layer over said substrate (paragraph [0052]), forming an ad-substrate composite;

forming openings (21) in the ad-substrate composite to match the spacing of corresponding the I/O pads (16) of the chip;

attaching the chips on the ad-substrate composite wherein the I/O pads of the chips are placed on the corresponding openings on the ad-substrate composite to form a package (10);

performing ball mounting over the openings on said ad-substrate of the package (22, 24); and

forming the CSP.

Akram et al. does not teach an adhesive layer with a thickness between 10 to 100 microns. Akram et al. is silent with respect to the thickness of the adhesive layer, only mentioning that an adhesive is applied. It would have been obvious to one of ordinary skill in the art to arrive at the optimal thickness of the adhesive layer through routine experimentation since it is desirable to provide adhesive layers having sufficient adhesiveness. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Moreover, one having ordinary skill in the art would have been required to arrive at the optimal thickness of the adhesive though experimentation, since Akram does not disclose the preferred thickness.

Akram et al. does not teach sawing the substrate to form the CSP. Sawing is a known method of singulation, as taught by Thomas (paragraph [0036]) and it would have been obvious to one of ordinary skill in the art to use a known and frequently practiced method of singulation, since it is desirable to use proven methods.

Akram et al. further teach using a polymeric substrate (sections [0016] and [0051] - [0053]). Akram et al. does not teach using bismaleimide triazine, a known polymer, for the substrate, as evidenced in paragraph [0035] of Master et al. It would have been obvious to one of ordinary skill in the art to employ the use of a known polymer, since it is desirable to use reliable materials that are suitable for the intended use.

Akram et al. do not teach forming a molding material around the package. Fanworth teaches forming a molding material around the package (Fig. 4 (32); Col. 6, lines 30 – 35). It would have been obvious for one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Fanworth into the method taught by Akram et al., since it is desirable to protect the chip from contamination and damage.

Akram et al. do not teach a method, wherein the attaching is accomplished by subjecting the adsubstrate to a temperature between 250° to 350° C at a pressure between 1.5 to 2.5 Mega Pascals. Yamamoto et al. teach a method, wherein the attaching is accomplished by subjecting the adsubstrate to a temperature between 250° to 350° C at a pressure between 1.5 to 2.5 Mega Pascals (Col. 9, lines 31 – 33 and 42 – 44). It would have been obvious to incorporate the method taught by Yamamoto et al. into the proposed method taught by Akram et al. and Fanworth since it is desirable to form a satisfactory bond.

Regarding claim 43, Akram et al. teach a method, wherein the chip comprises silicon (Paragraph [0005]).

Regarding claim 44, Akram et al. teach a method, wherein the I/O pads are an area array type (paragraph [0048]).

Regarding claim 45, Akram et al. teach a method, wherein the substrate comprises a ball grid array.

Regarding claim 47, Akram et al. teaches a method, wherein forming the openings is accomplished by mechanical or laser drilling , or screen printing (paragraph [0084]).

Regarding claim 48, Regarding claim 20, neither Akram et al., Fanworth, Thomas, Masters et al or Yamamoto et al. teach a method, wherein the openings have a diameter between 350 to 900 microns. It would have been obvious to one of ordinary skill to arrive at the optimal diameter through routine experimentation, since it is desirable for the diameter to be a sufficient size for the contacts.

Regarding claim 49, Akram et al. does not teach a method, wherein the molding comprises epoxy resin. Fanworth teaches a method, wherein the molding comprises epoxy resin. It would have been obvious to one of ordinary skill to incorporate the teaching of Fanworth into the method taught by Akram et al. for reasons discussed above.

Regarding claim 50, Akram et al. does not teach a method, wherein the ball mounting is accomplished with a solder comprising tin-lead or tin-silver alloy. Fanworth teaches a method, wherein the ball mounting is accomplished with a solder comprising a tin-lead alloy (Col. 5, lines 29 – 34). It would have been obvious to incorporate the teaching of Fanworth into the method taught by Akram et al. for reasons discussed

above. Additionally, the tin-lead alloy and tin-silver alloy are known materials that are well suited for the intended use.

Regarding claim 51, neither Akram et al. nor Fanworth, Thomas, Masters et al. or Yamamoto et al. teach a method, wherein the height of the ball mountings is between 300 and 800 microns. It would have been obvious to arrive at the optimal height through routine experimentation, since it is desirable for the ball mounting to have a size that would ensure a reliable contact.

7. Claim 46 rejected under 35 U.S.C. 103(a) as being unpatentable over Akram et al., Thomas, Masters et al. and Yamamoto et al. as applied to claim 42 above, and further in view of Umehara et al.

Neither Akram et al., Fanworth, Thomas, Masters et al. or Yamamoto et al. teach a method, wherein the adhesive layer comprises polyimide thermocompression adhesive. Umehara et al. teach using a polyimide thermocompression adhesive (Col. 2, lines 50 – 55). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a polyimide thermocompression adhesive, since it is a known material and it is desirable to use materials that are well suited for the intended use, as well as employing reliable adhesives.

Allowable Subject Matter

8. Claims 26 – 32 and 34 – 41 are allowed.

Response to Arguments

9. Applicant's arguments filed March 5, 2004 have been fully considered but they are not persuasive.

Applicant argues that the combination of Akram et al. and Fanworth does not teach a process wherein vias are opened in the ad-substrate followed by attaching the chip to the ad-substrate. Akram et al. teach each of the steps of forming openings in the ad-substrate composite and attaching the chips on the ad-substrate composite to form a package. There is nothing in the claims require a specific order of performing each step. The open claim language only requires that each of the steps are included in the method. Additionally, it has been held that the selection of any order of process steps is prima facie obvious in the absence of new or unexpected results. See *Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959) (Prior art reference disclosing a process of making a laminated sheet wherein a base sheet is first coated with a metallic film and thereafter impregnated with a thermosetting material was held to render prima facie obvious claims directed to a process of making a laminated sheet by reversing the order of the prior art process steps.). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 571-272-1662. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Douglas W. Owens
Patent Examiner